Approximate Analysis of Multistage Amplifiers

Assume $r_x = 0$ and $r_o = \infty$

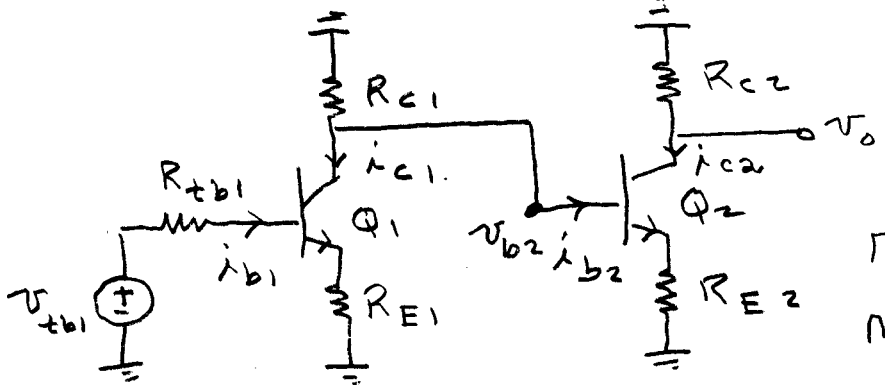
Use the equations

$$i_c = \alpha i_e = \beta i_b$$

$$r_{ib} = r_\pi + (1+\beta) R_{te}$$

$$r_{ie} = \frac{R_{tb}}{1+\beta} + r_e$$

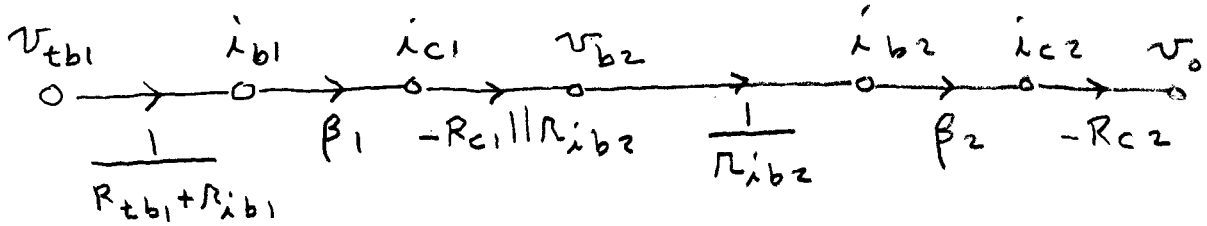
CE/CE Amplifier



$$r'_{ib_1} = r_{\pi 1} + (1+\beta_1) R_{E1}$$

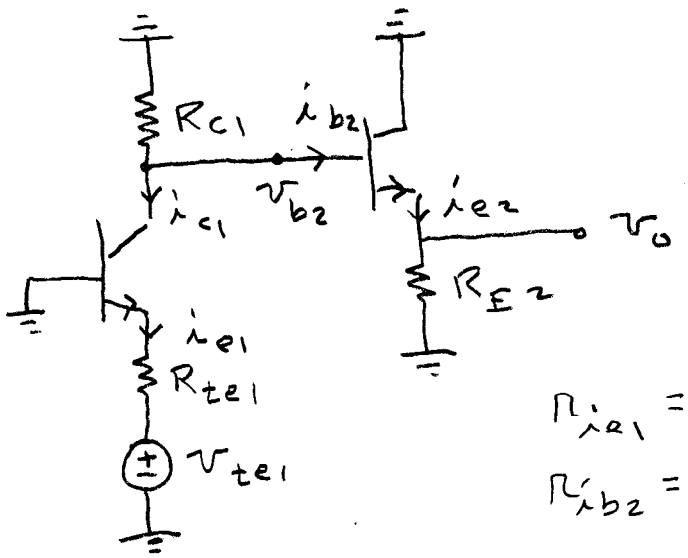
$$r'_{ib_2} = r_{\pi 2} + (1+\beta_2) R_{E2}$$

Flow Graph



$$\frac{v_o}{v_{tb1}} = \frac{\beta_1}{R_{tb1}+r_{ib1}} \times (-R_{c1} \| r_{ib2}) \times \frac{\beta_2}{r_{ib2}} \times (-R_{c2})$$

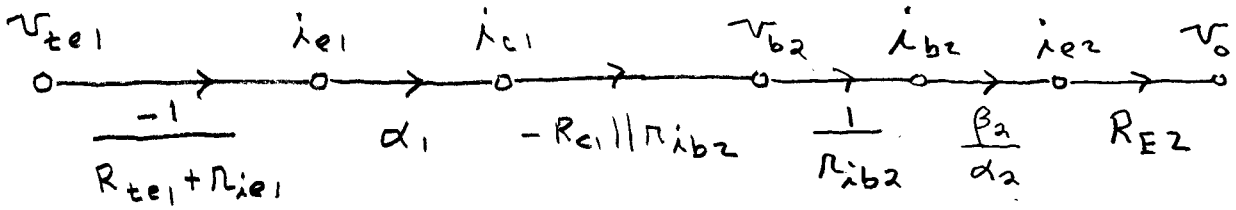
CB/CC Amplifier



$$r_{ie1} = r_{e1}$$

$$r_{ib2} = r_{\pi 2} + (1+\beta_2) R_{E2}$$

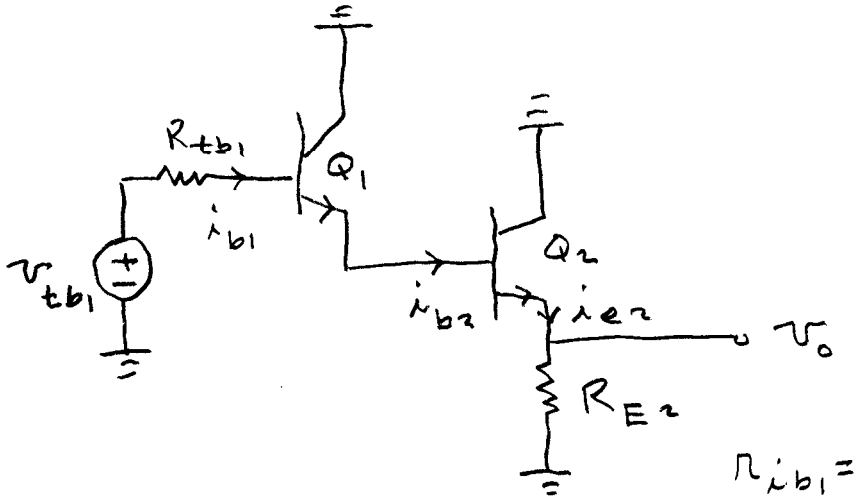
Flow Graph



$$\frac{v_o}{v_{te1}} = \frac{-\alpha_1}{R_{te1}+r_{ie1}} \times (-R_{c1} \| r_{ib2}) \times \frac{\beta_2/\alpha_2}{r_{ib2}} \times R_{E2}$$

3-6/11/03

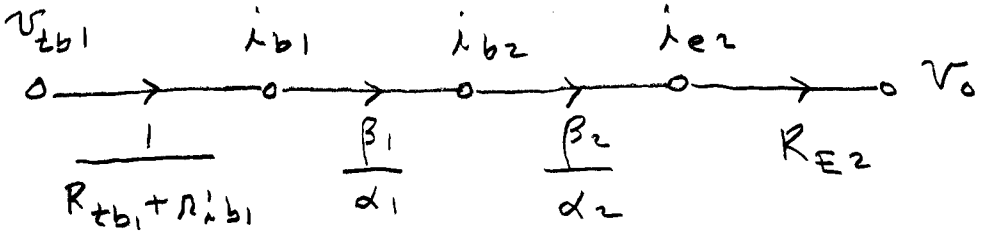
CC/CC Amplifier



$$R_{ib1} = R_{\pi 1} + (1+\beta_1) R_{ib2}$$

$$R_{ib2} = R_{\pi 2} + (1+\beta_2) R_{E2}$$

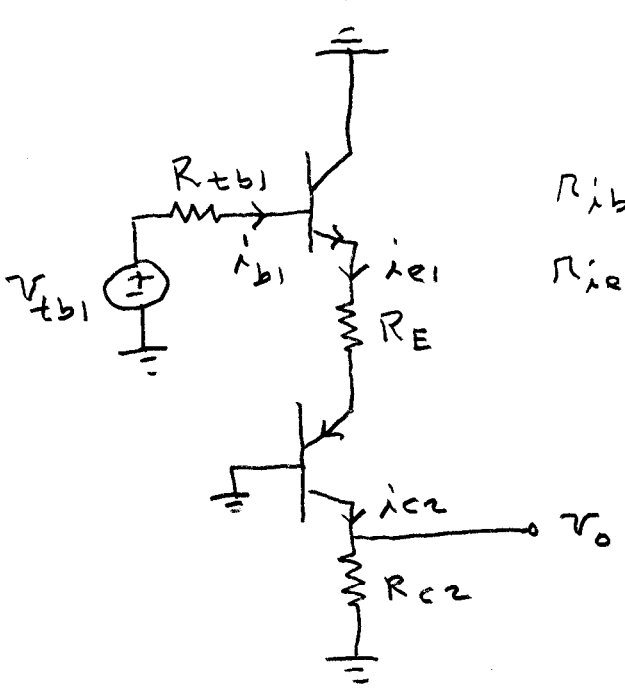
Flow Graph



$$\frac{v_o}{v_{tb1}} = \frac{\beta_1/\alpha_1}{R_{tb1}+R_{ib1}} \times \frac{\beta_2}{\alpha_2} \times R_{E2}$$

4-6/11/03

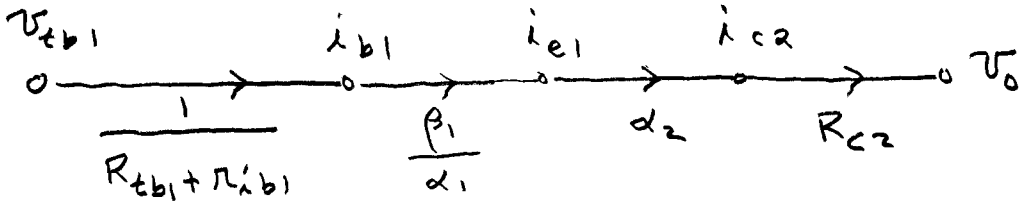
CC/CB Amplifier



$$R_{ib1} = R_{\pi 1} + (1+\beta_1)(R_E + R_{ie2})$$

$$R_{ie2} = R_{e2}$$

Flow Graph



$$\frac{v_o}{v_{tb1}} = \frac{\beta_1/\alpha_1}{R_{tb1}+R_{ib1}} \times \alpha_2 \times R_{c2}$$